



AIRSPACE SYSTEMS PROGRAM

NASA 2004 ACAST Workshop

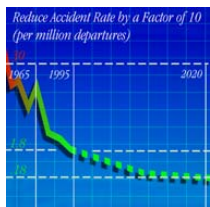


Robert Jacobsen
Program Manager

August 24-25, 2004

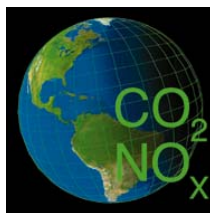


Aeronautics Technology Objectives



Protect Air Travelers and the Public

Decrease the aircraft fatal accident rate and the vulnerability of the air transportation system to threats, and mitigate consequences of accidents and hostile acts.



Protect the Environment

Protect local and global environmental quality by reducing aircraft noise, emissions and other contaminants.



Increase Mobility

Enable more people and goods to travel faster and farther, with fewer delays.



Partnerships for National Security

Enhance the Nation's security through partnerships with DoD and other U.S. and international government agencies.

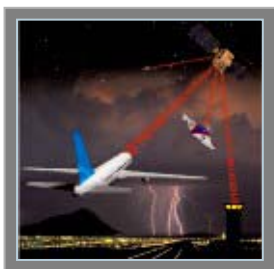


Explore New Aeronautical Concepts

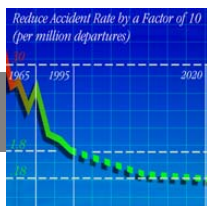
Create novel aeronautics concepts and technology to support science missions and terrestrial and space applications.

Aeronautics Technology

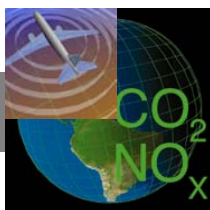
Objectives



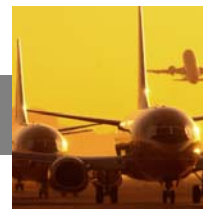
Aeronautics Technology



Protect Air Travelers and the Public



Protect the Environment



Increase Mobility



Partnerships for National Security



Explore New Aeronautical Concepts

Enable more people and goods to travel faster and farther, with fewer delays

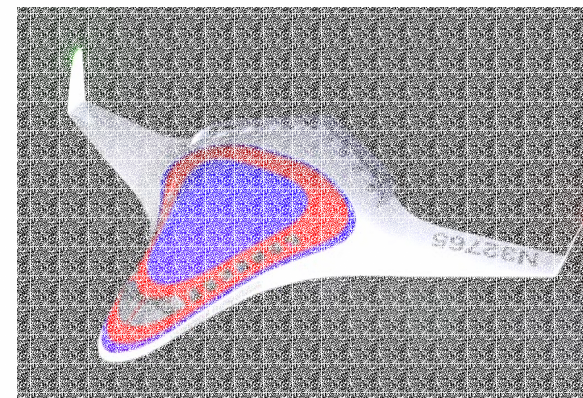
Programs



Airspace Systems



Aviation Safety & Security



Vehicle Systems

Airspace Systems Program

Goal:

Enable, through technology development and transfer of the technology, major increases in the capacity and mobility of the air transportation system by development of revolutionary concepts for operations and vehicle systems



Objectives:

- *Improve throughput, predictability, flexibility, collaboration, efficiency, and access of the NAS*
 - *Enable general aviation and runway-independent aircraft operations*
- *Maintain system safety, security and environmental protection*
- *Enable modeling and simulation of air transportation operations*

Airspace Systems Program Structure



Strategic Focus Areas

Efficient Traffic Flow

System-Wide Operations Technologies

Airspace Human Factors

Projects

Advanced Air Transportation Technologies

Efficient Aircraft Spacing

Efficient Flight Path Management

Small Aircraft Transportation System

Strategic Airspace Usage

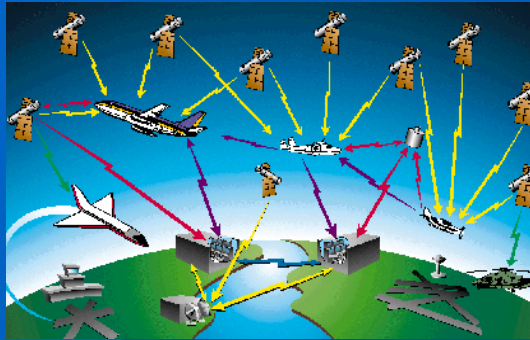
Virtual Airspace Modeling & Simulation

Space-Based Technologies

Human Measures & Performance

Airspace Systems Projects

Advanced Air Transportation Technologies



*Air Traffic Management
Decision Support Tools*

Virtual Airspace Modeling & Simulation



*Advanced Concepts, NAS
Modeling/Simulation Capability*

Small Aircraft Transportation System



*Improved Public Mobility & Community
Access with Small Aircraft/Airports*

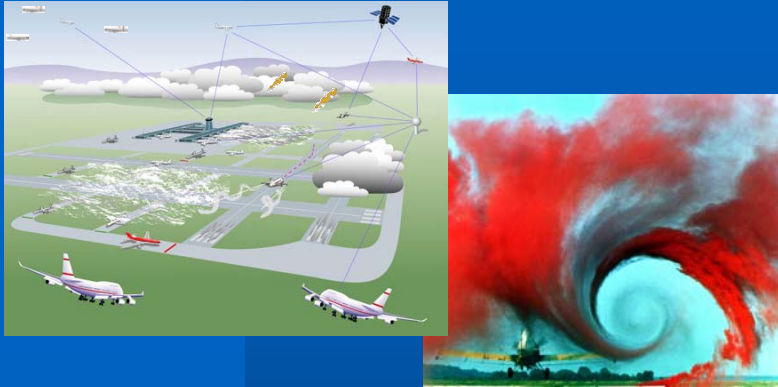
Human Measures and Performance



Human/Computer Technologies

Airspace Systems Projects, cont.

Efficient Aircraft Spacing



Airborne Separation & Wake Vortex

Space-Based Technologies



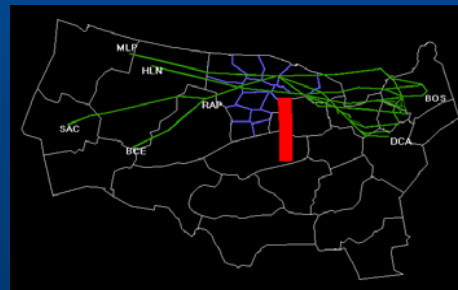
*Advanced CNS Architectures
& Systems Technology*

Efficient Flight Path Management



*Integrated Traffic
Management Tools*

Strategic Airspace Usage



Strategic Traffic Flow Management

Airspace Systems Program Portfolio

AATT

1st-generation ATM Aids

New Projects

EAS

*Airborne Separation
Wake Vortex*

EFPM

*Integrated Traffic
Management Tools*

SATS

Small Airport Operations

VAMS

*NAS Model/Simulation Capability
Next-gen ATM/ATC Concepts*

SAU

*Strategic Traffic
Flow Management*

SBT

*Advanced CNS Architect.
& Systems Technology*

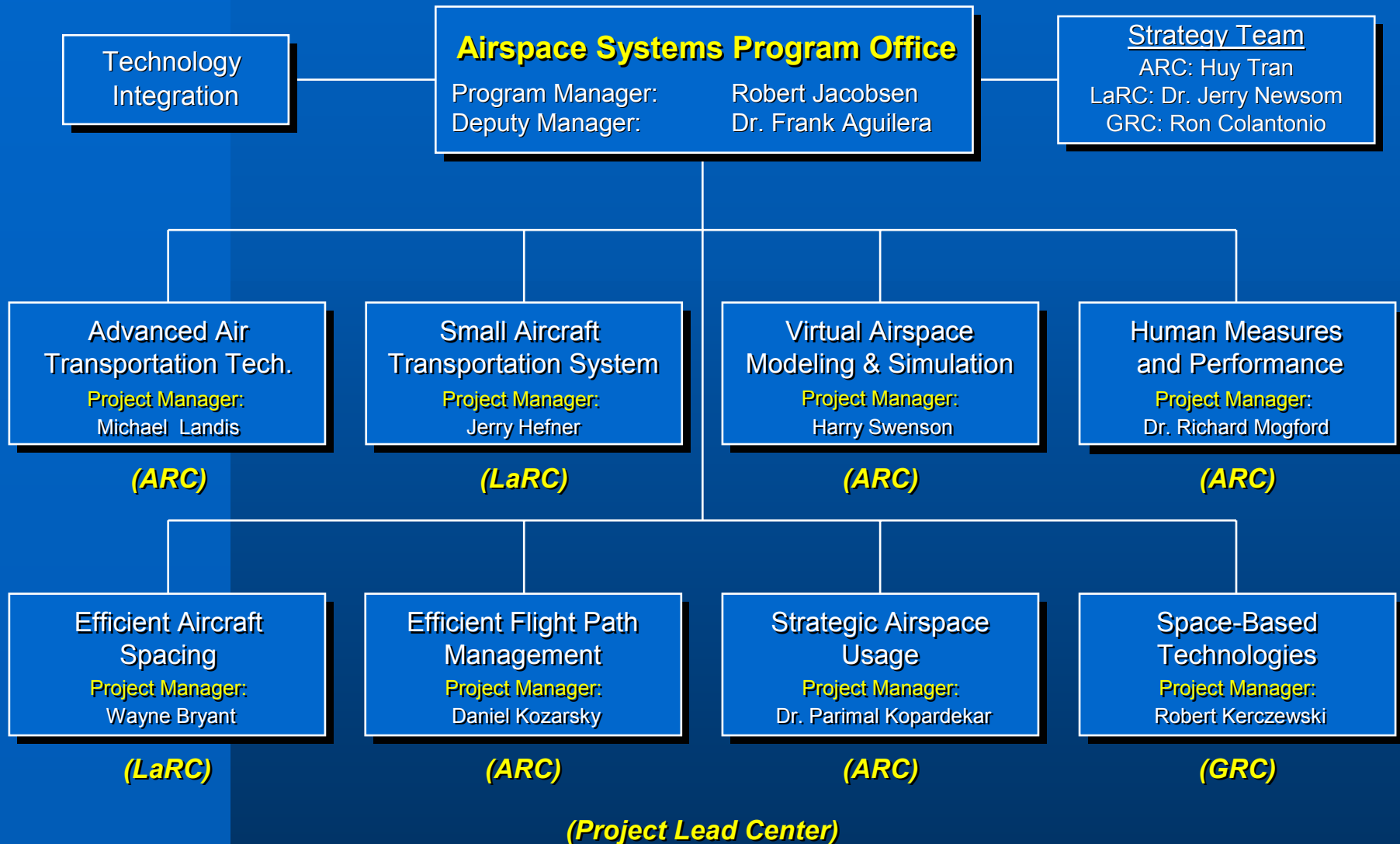
AOS

*Human/System Concepts
and Procedures*

HMP

*Human/Computer
Technologies*

Airspace Systems Program Organization



AS Program Customers/Stakeholders

NASA

NASA/FAA

Interagency Integrated
Product Team (IAIPT)

**ATS Joint Planning &
Development Office**

FAA

**SafeFlight 21
Program Office**

OEP Program Office

Airspace Systems Program

AATT

EAS

SATS

EFPM

VAMS

SAU

HMP

SBT

Advisory Groups

- Aeronautics Research Advisory Committee
AS Subcommittee
- National Research Council

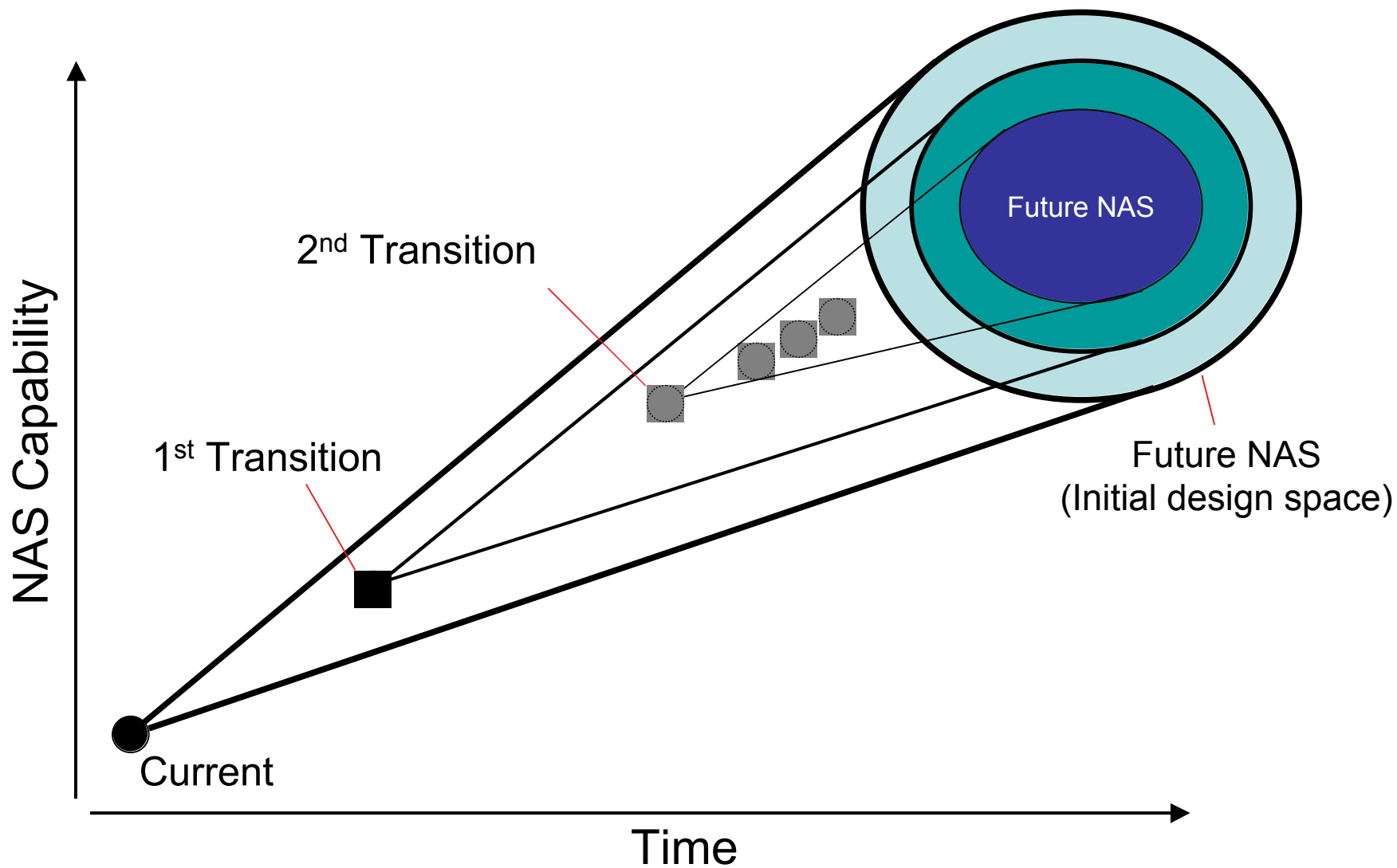
Participation with Stakeholders

- RTCA
- NCAM
- AIAA, AHS, SAE, ATA, ALPA, NATCA,
ATCA, GAMA
- Industry
- FAA RE&D Advisory Committee
FAA/Eurocontrol R&D Committee
- ICAO

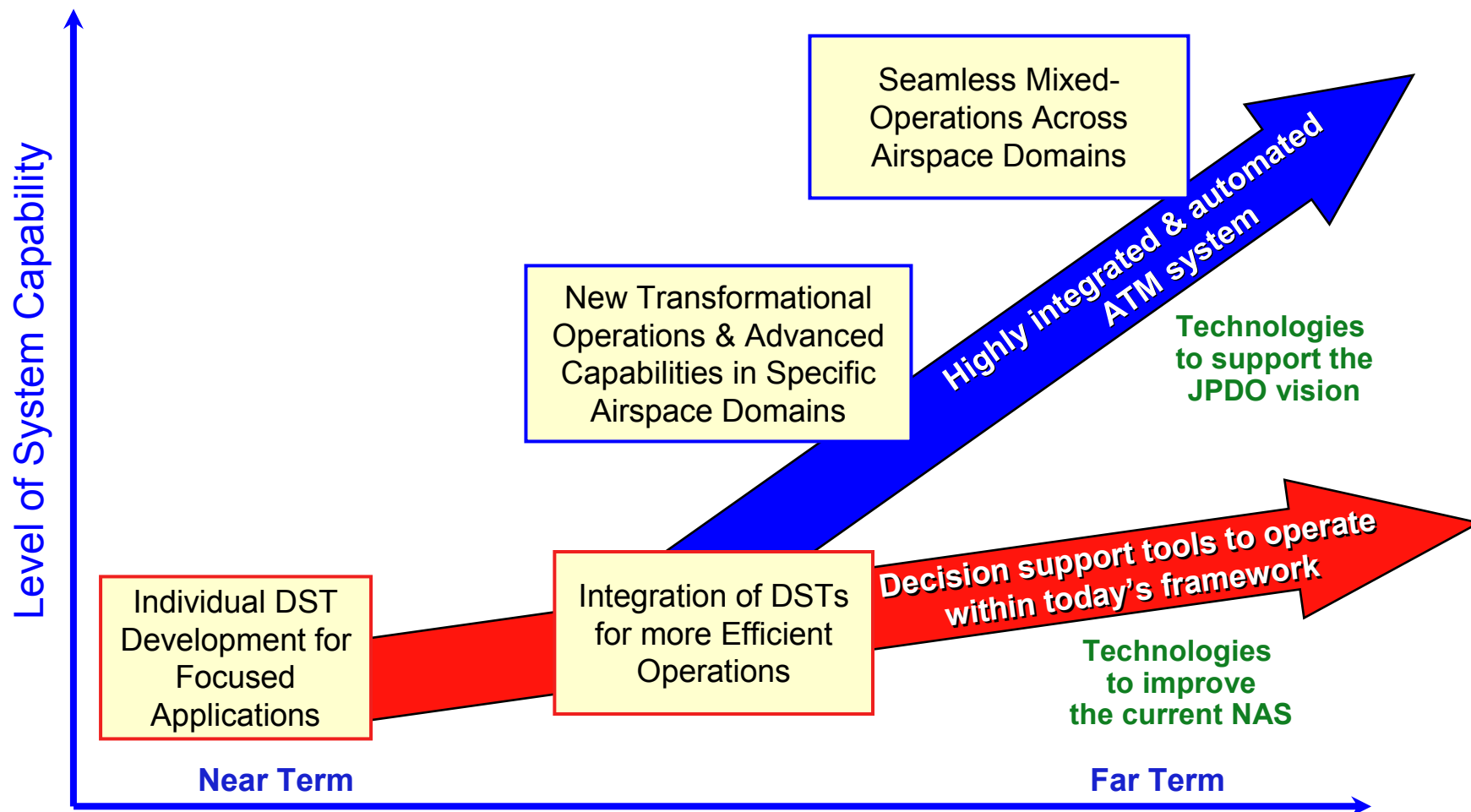
Related Programs

- NASA
 - Aviation Safety and Security Program
 - Vehicle Systems Program
 - Transforming the NAS (TNAS) Initiative (Over-Guide)
- FAA
 - SafeFlight 21 Program Office
 - NAS Operational Evolution Plan
 - Office of System Architecture and Investment Analysis (ATO)
 - Office of Communication, Navigation, and Surveillance Systems (ATO)
 - Office of Aviation Research (ATO)
 - Air Traffic Service, Flight Standard Service & Aircraft Certification
 - William J. Hughes Technical Center (ATO)
- Air Transportation System Joint Planning and Development Office (JPDO)

Transforming the NAS



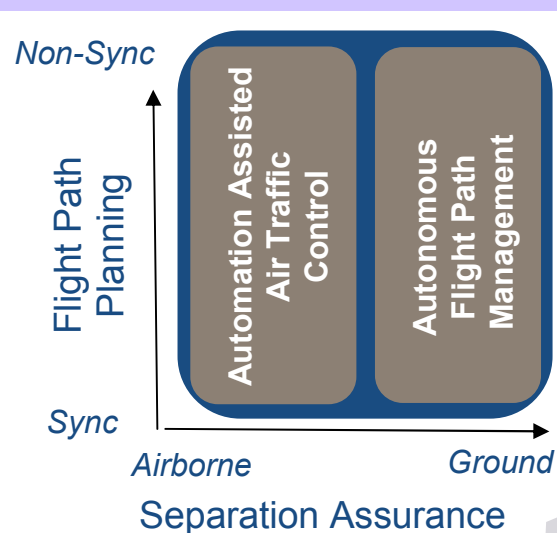
Why Transformation is Needed



Scope of Transforming the NAS

System Evaluation and Engineering

Transformational Operations



Advanced Capabilities

Quality of Information

- Weather
- Precision CNS

Information Sharing

- Airspace mobility communication networks
- SWIM selected information technologies
 - Management
 - Dissemination
 - Control

Technology Insertion

CNSi Avionics Cert.

- Methodologies
- International interoperability

ATM Software Devel. and Cert. Criteria

- Requirements based code generation
- Extendable software architectures
- Automated system verification and validation

Rqmts

Dynamic Traffic Flow Prediction/Management

Optimized Surface Operations

Systems for Unique Aircraft Operations

Domain

- En Route
 - Oceanic
 - Low density
 - Complex
- Term/Airport
 - High Density
 - Secondary

UAV Operations

University/Base Research

Advanced Capabilities

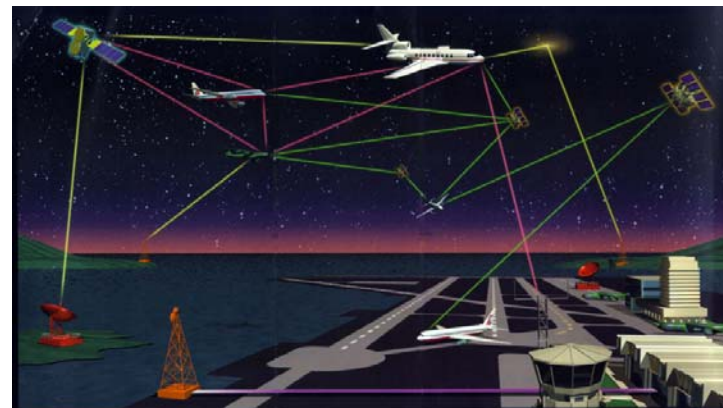
Quality of Information and Information Sharing

Objective

Improve the accuracy and availability of weather and CNS information, and develop and evaluate architecture options and selected technologies to enable the dissemination and management of all information within the NAS

Task Areas

- **Weather Products for NAS Operations**
 - Develop requirements for use by airborne and ground ATM automation
 - Adapt weather products for use within ATM automation
 - Develop advanced technologies for weather forecasting
- **Precision CNS System Concepts**
 - Develop CNS architecture and roadmap
- **Airspace Mobility Communication Networks**
 - Develop candidate network designs
 - Develop enabling communications network technologies
 - Conduct trade studies
 - Validate concepts and technologies
- **Selected technologies for system-wide information management (SWIM)**
 - Conduct systems evaluation and engineering
 - Develop operational concepts and information architectures
 - Develop and validate software for data distribution and management
 - Conduct proof-of-concept components tested in a relevant environment



Deliverables

- Adapted of weather products for integration with ATM automation
 - Inclusion of probability, airspace permeability, and improved accuracy into weather products
- Optimal portfolio of sensors and platforms for characterizing weather
 - Proof of concept and business case for expanded use of sensors (e.g. in-situ and profiler) and platforms (e.g. ground based and air mobile/UAVs) for critical weather information
- CNS architecture and roadmap
- Airspace mobility communication network architecture
 - Secure mobile communication network architecture (IPv6-based), concept of use, and infrastructure transition roadmap, with critical mobile network elements demonstrated in relevant flight environment
- Candidate evolvable and extendable architectures and techniques for System Wide Information Management (SWIM)